

Demand-Driven Risk Premia in FX and Bond Markets

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Fixed Income Research and Implications for Monetary Policy

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Disclaimer: The views expressed do not necessarily reflect those of the Bank of Canada's Governing Council.

Preview of Results: Demand Shocks Around Treasury Auctions

$$\Delta s_t = \alpha + \beta D_t + \varepsilon_t$$

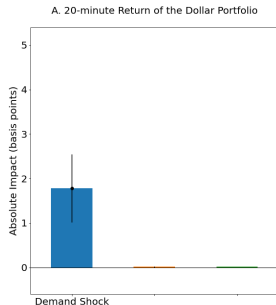
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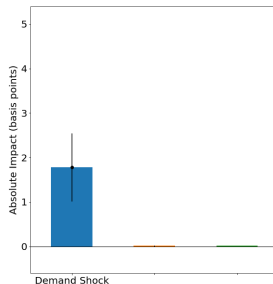


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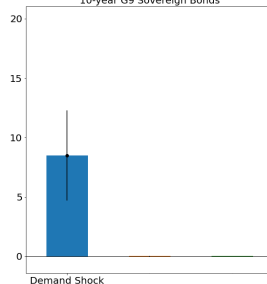
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2. Global bond returns **increase**

A. 20-minute Return of the Dollar Portfolio



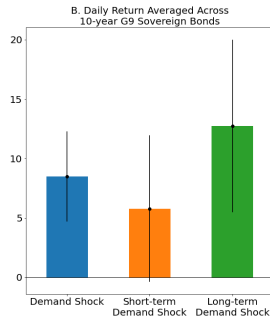
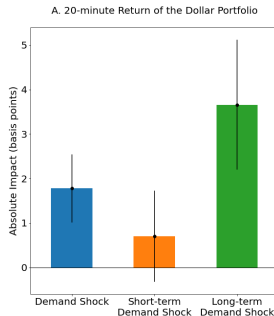
B. Daily Return Averaged Across 10-year G9 Sovereign Bonds



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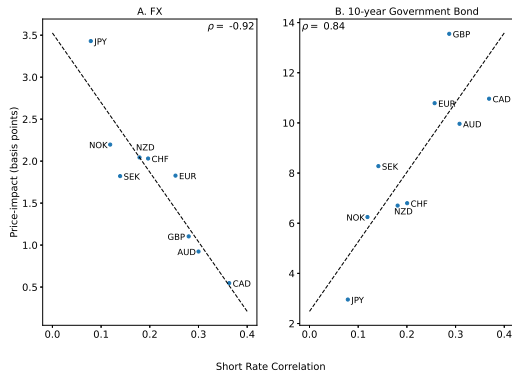
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2. Global bond returns **increase**
3. Impact **rises** with maturity
4. **Diverging** effects across markets



Roadmap

- 1) **Identification Strategy:** High-frequency shocks around Treasury auctions
 - ▶ Following Ray et al. (2024)
 - 2) **Empirical Findings:**
 - ▶ Foreign currencies and global bond returns systematically appreciate following (positive) U.S. Treasury demand shocks
 - ▶ Ind. Bidders (for. investors and funds) play key role for risk premia in both markets
 - 3) **Economic Mechanisms:**
 - ▶ **Cross-country variation:** Short-rate correlations determine transmission channels via FX and bond risk premia
 - ▶ **Time-series variation:** Safe asset status of UST affects strength of FX channel
- ▶ **This paper:** Provides empirical evidence for a quantity-based theory of risk premia and a strong cross-market link between FX and bonds.

Literature Review

► **Quantity-Driven Demand Shifts**

Gourinchas et al. (2024), Greenwood et al. (2023), Phillot (2023), Ray et al. (2024), Jiang et al. (2024), Koijen and Yogo (2019)

► **Treasury auctions and safe-asset demand**

Eren et al. (2023); Bräuning and Stein (2024); Jansen et al. (2024); Antolin-Diaz (2024); Somogyi et al. (2024); Zou (2024)

► **High-Frequency Shock-Identification**

Gürkaynak et al. (2005); Nakamura and Steinsson (2018); Mueller et al. (2017); Antolin-Diaz et al. (2023); Boehm and Kroner (2024)

► **Impact of QE and unconv. MP on global financial markets**

Dedola et al. (2021), Bauer and Neely (2014), Ferrari et al. (2021)

Data

- ▶ Sample period: 2002-2018
- ▶ Treasury Auctions: www.treasurydirect.gov/auctions
- ▶ Foreign exchange (FX) Data: Refinitiv Tick History
 - ▶ G9 currencies vis-à-vis U.S. dollar
 - ▶ AUD, CAD, CHF, EUR, GBP, JPY, NOK, NZD, SEK
 - ▶ Approx. 75% of daily FX turnover (BIS (2022))
 - ▶ Sampled at 5-min frequencies
- ▶ Treasury Futures: CME
 - ▶ High-frequency traded prices
 - ▶ Various maturities: 2Y-30Y
 - ▶ Sampled at 5-min frequencies
- ▶ Global Zero-Coupon Bonds (Daily, Bloomberg)

UST Auctions: Summary Statistics

	Mean	Std	Min	P25	P50	P75	Max	N
Offering Amount (billions)	24.88	8.55	5.00	18.00	25.00	32.00	44.00	944
Term (Years)	8.52	8.83	1.99	3.00	5.00	9.92	30.02	944
Bid-Coverage Ratio	2.66	0.46	1.22	2.37	2.61	2.91	4.07	944
Direct Bidders	0.22	0.16	0.00	0.09	0.19	0.34	0.84	918
Indirect Bidders	0.55	0.18	0.03	0.43	0.54	0.68	1.11	918
Primary Dealers	1.90	0.34	0.97	1.65	1.86	2.09	3.12	918

- ▶ Auctions are frequent and pre-scheduled events.

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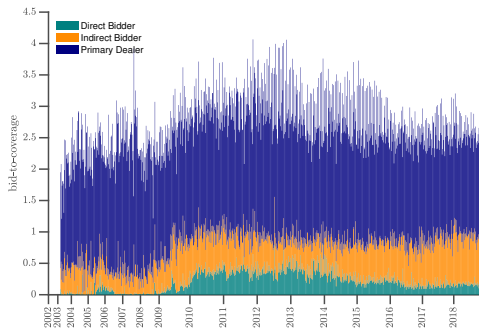
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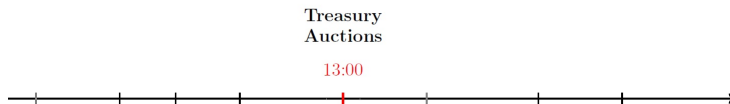
- ▶ Auctions are frequent and pre-scheduled events.
- ▶ On average, \$25 billion are offered.
- ▶ Maturity of debt instruments varies: 2Y-30Y.
- ▶ The bid-to-cover ratio consistently exceeds supply.

UST Auctions: Bid-Coverage Ratio



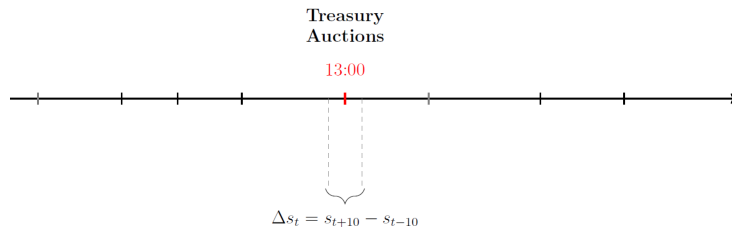
- ▶ Heterogeneous set of agents participate in auctions.
- ▶ Demand by bidders varies over time, but typically exceeds safe asset supply.
- ▶ Primary dealers submit most bids, followed by indirect bidders.

UST Auctions: Demand Shocks



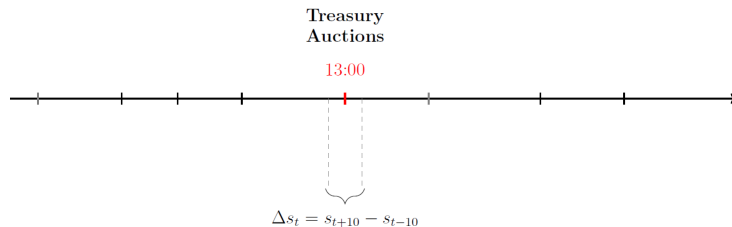
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UST Auctions: Demand Shocks



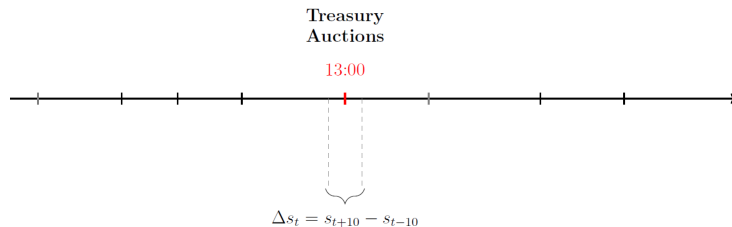
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- ▶ High-frequency shock around Treasury auctions.
 - ▶ Δs_t : (log) price change in a 20-min around auctions.
 - ▶ Akin to literature on MP-shocks (Gürkaynak et al. (2005)).

UST Auctions: Demand Shocks



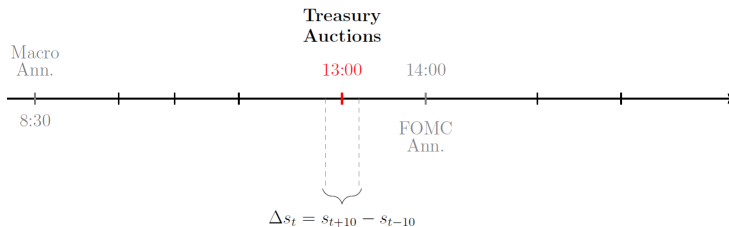
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 - ▶ Supply is fixed and well-known in advance.

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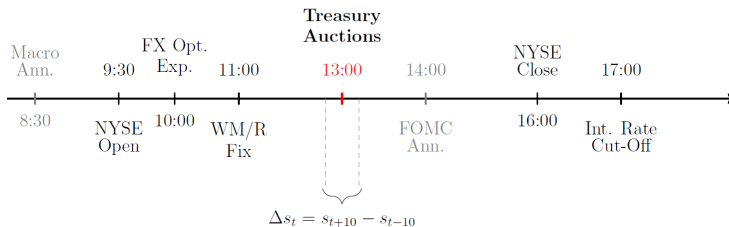
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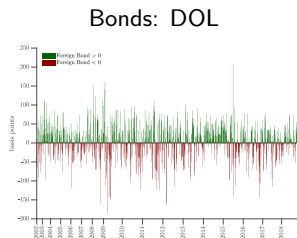
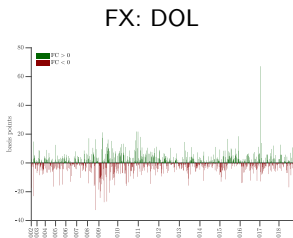
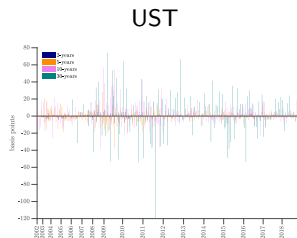
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UST Auctions: Shock Dynamics



- ▶ Increasing number of auctions in recent years.
- ▶ Strong DOL movements within a short window.
- ▶ Positive and negative responses in FX and global bond markets.

UST Auctions: Regression Results - Treasury Futures

$$\Delta s_t = \alpha + \beta D_t + \varepsilon_t.$$

	FX					Bonds				
	2-year	5-year	10-year	30-year	Pooled	2-year	5-year	10-year	30-year	Pooled
D	0.70 (0.52)	1.73*** (0.42)	2.26** (0.94)	3.66*** (0.75)	1.78*** (0.39)	1.05* (0.58)	4.74*** (1.82)	7.01*** (2.59)	37.34*** (9.15)	8.47*** (1.96)
N	339	191	288	126	944	339	191	288	126	944
R ²	0.02	0.10	0.09	0.33	0.08	0.00	0.02	0.01	0.04	0.02

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- Foreign currencies and bond returns increase in response to demand shocks

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- ▶ Foreign currencies and bond returns increase in response to demand shocks
- ▶ The magnitude of the response increases with bond maturity.
 - ▶ FX: 0.70 bps (2-year) to 3.66 bps (30-year)
 - ▶ Bonds: 1.05 bps (2-year) to 37.34 bps (30-year)

UST Auctions: Regression Results - Bid-to-Cover Ratio

$$\Delta s_t = \alpha + \beta D_t^{BC} + \varepsilon_t$$

	FX				Bonds			
	$D^{BC,Tot}$	$D^{BC,PD}$	$D^{BC,IndBid}$	$D^{BC,IndBid}$	$D^{BC,Tot}$	$D^{BC,PD}$	$D^{BC,IndBid}$	$D^{BC,DBid}$
D_t^{BC}	1.33*** (0.30)	0.55 (0.48)	1.69*** (0.35)	0.43 (0.28)	5.53** (2.17)	3.36 (3.55)	5.54*** (2.30)	3.23 (2.39)
N	944		944		944		944	
R^2	0.03		0.06		0.02		0.02	

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- Robust to alternative specifications, including changes in the bid-to-cover ratio

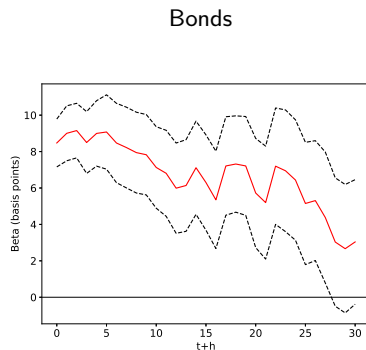
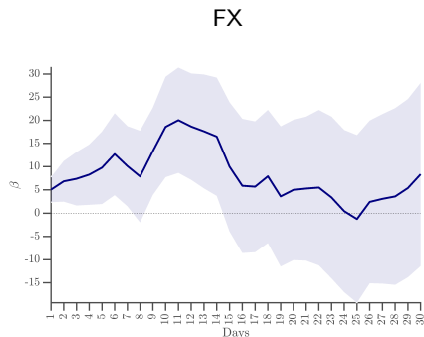
UST Auctions: Regression Results - Bid-to-Cover Ratio

$$\Delta s_t = \alpha + \beta_j \sum D_t^j + \varepsilon_t$$

	FX				Bonds			
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- ▶ Robust to alternative specifications, including changes in the bid-to-cover ratio
- ▶ Demand shocks from indirect bidders drive returns in both FX and bond markets
- ▶ Allocations to for. investors and funds play a key role in explaining risk premia

UST Auctions: Shock Persistence



- ▶ Demand shocks have strong and persistent impact in both markets
- ▶ In FX markets, foreign currency appreciation persists for nearly three trading weeks
- ▶ In bond markets, the impact persists even longer than in FX markets.

Robustness

- ▶ Bootstrap Exercise: [▶ Bootstrap Exercise](#)
- ▶ Alternative window sizes around auctions.
- ▶ Alternative FX datasets.
- ▶ (Indicative) quoted prices vs. executed traded prices.
- ▶ Alternative measures and specifications of demand shocks.
- ▶ Seasonal Effects (e.g., End-of-Month, End-of-Year)
- ▶ Crisis vs. non-crises periods.

Understanding risk premia: Why FX and bond markets co-move

FX Risk Premium

UIP trade: borrow in USD at i_t , invest in foreign currency at i_t^* :

$$\underbrace{E_t(\Delta s_{t+1})}_{\text{Expected change in FX}} = \underbrace{(i_t - i_t^*)}_{\text{Interest rate differential}} + \underbrace{rp_t^{FX}}_{\text{FX risk premium}}$$

When US short rate i_t rises unexpectedly:

- ▶ Financing costs increase
- ▶ FX trade loses money

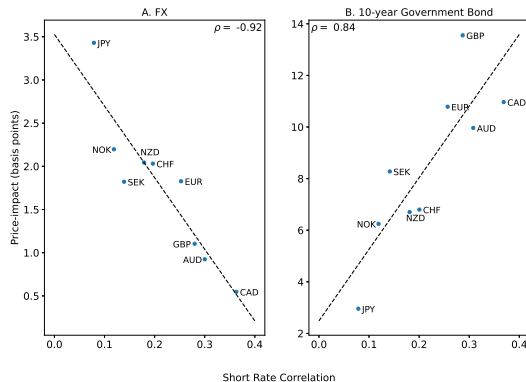
Bond Term Premium

Yield curve trade: borrow short at i_t , invest long at y_t^τ :

$$\underbrace{y_t^\tau}_{\text{Long-term yield}} = \underbrace{\frac{1}{\tau} \sum_{j=0}^{\tau-1} E_t(i_{t+j})}_{\text{Average expected short rates}} + \underbrace{tp_t^\tau}_{\text{Term premium}}$$

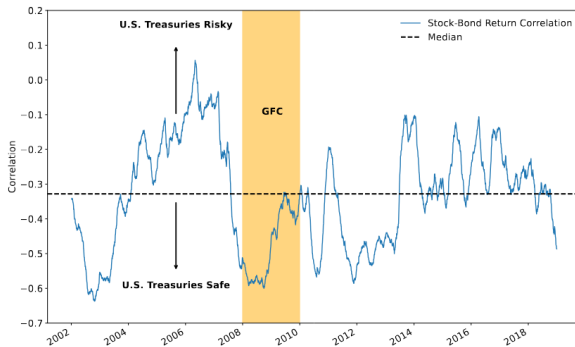
- ▶ Long bond prices fall
- ▶ Yield curve trade loses money

Price Impact and Short-Rate Correlations



- Price impact varies systematically with short-rate correlation:
 - FX: Impact **decreases** as short-rate correlation rises
 - Bonds: Impact **increases** as short-rate correlation rises

Stock-bond correlation impacts safety of US Treasuries



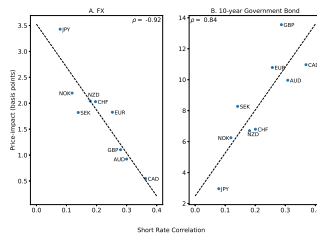
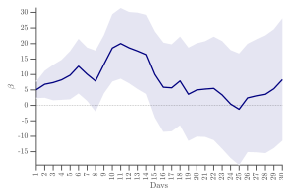
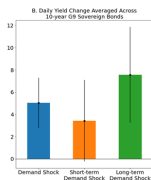
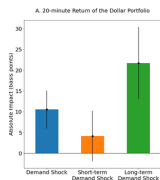
- ▶ Stock-bond correlation measures when Treasury bonds can hedge stock market risk
- ▶ **Negative correlation** → Treasuries function as **safe assets**
- ▶ **Positive correlation** → Treasuries exhibit **risky asset** behavior

Impact of demand shocks varies by risk regime

- ▶ **Key finding:** $D \times \rho$ interaction term is strongly positive
- ▶ When $\rho > 0$ (risky regime):
 - ▶ Stronger foreign currency appreciation
- ▶ When $\rho < 0$ (safe regime):
 - ▶ Weaker or reversed even effect

	DOL	DOL
D_t	1.78*** (0.39)	2.43*** (0.43)
ρ_t		0.14 (0.19)
$D_t \times \rho_t$		1.07*** (0.39)
N	944	944
R^2	0.08	0.11

Conclusion



- ▶ Demand shocks around U.S. auctions spill over into global FX and bond markets
- ▶ Market responses are stronger for longer-maturity debt instruments
- ▶ In the cross-section, co-movement in short-term interest rates plays a key role
- ▶ Overall, the findings support the predictions of habitat investor models

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Appendix: Bid-to-Cover Regressions

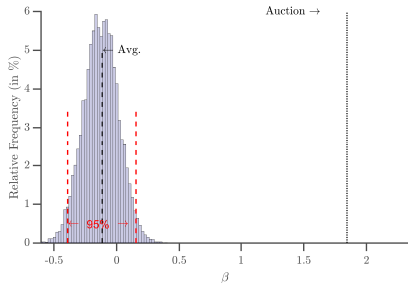
$$\Delta s_t = \alpha + \beta D_t + \varepsilon_t.$$

where D_t refers to the unexpected change in the aggregated bid-to-cover ratio

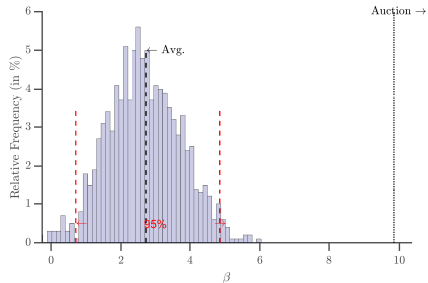
Panel A: Currency Markets										
	AUD	CAD	CHF	EUR	GBP	JPY	NOK	NZD	SEK	DOL
Bid-to-Cover Ratio	0.90* (0.47)	0.23 (0.36)	1.54*** (0.42)	1.29*** (0.40)	1.08*** (0.36)	2.27*** (0.50)	1.64*** (0.49)	1.92*** (0.51)	1.16*** (0.45)	1.33*** (0.30)
N	944	944	944	944	944	944	944	944	944	944
R^2	0.01	0.01	0.02	0.02	0.01	0.03	0.04	0.02	0.01	0.03
Panel B: Global Bond Markets										
	AUD	CAD	CHF	EUR	GBP	JPY	NOK	NZD	SEK	DOL
Bid-to-Cover Ratio	7.42* (4.09)	8.01*** (3.02)	5.66*** (2.13)	4.38 (2.79)	9.62*** (3.21)	0.79 (1.68)	4.00 (3.01)	5.15* (3.02)	4.70 (3.00)	5.53** (2.17)
N	916	916	916	916	916	916	916	916	916	916
R^2	0.01	0.02	0.01	0.01	0.01	0.00	0.01	0.01	0.00	0.01

Appendix: Bootstrap Exercise

FX



Bonds



► Back

Appendix: Short-Rate Correlation and Demand Shock Pass-Through

$$\Delta s_{i,t} = \alpha_i + \beta D_t \times \rho_{i,t}^{SR} + \varepsilon_{i,t}$$

$$\Delta y_{i,t} = \alpha_i + \gamma D_t \times \rho_{i,t}^{SR} + \varepsilon_{i,t}$$

		Bonds			
	FX	2-year	5-year	10-year	30-year
$D_t \times \rho_{i,t}^{SR}$	-0.408*** (-7.79)	0.066 (0.80)	0.388* (1.81)	1.584*** (3.99)	3.124*** (3.17)
N	8,514	8,550	8,550	8,550	8,550
R^2	0.561	0.232	0.436	0.544	0.446

► Back

Appendix: Bid-to-Cover Regressions - Bidder Type

$$\Delta s_t = \alpha + \beta_j \sum D_t^j + \varepsilon_t$$

$$\Delta y_t = \alpha + \gamma_j \sum D_t^j + \varepsilon_t$$

Panel A: Currency Markets										
	AUD	CAD	CHF	EUR	GBP	JPY	NOK	NZD	SEK	DOL
Direct Bidders	0.26 (0.71)	-0.05 (0.63)	0.55 (0.52)	0.55 (0.48)	0.28 (0.50)	1.84** (0.73)	0.47 (0.65)	0.17 (0.78)	0.86 (0.71)	0.55 (0.48)
Indirect Bidders	2.02*** (0.51)	1.11*** (0.39)	1.39*** (0.44)	1.30*** (0.41)	1.19*** (0.44)	2.13*** (0.48)	1.98*** (0.52)	2.56*** (0.52)	1.55*** (0.49)	1.69*** (0.35)
Primary Dealers	0.00 (0.44)	-0.22 (0.39)	0.61 (0.38)	0.34 (0.32)	0.31 (0.37)	1.16*** (0.43)	0.53 (0.44)	0.97* (0.50)	0.15 (0.38)	0.43 (0.28)
N	914	914	914	914	914	914	914	914	914	914
R ²	0.04	0.04	0.03	0.04	0.02	0.06	0.06	0.05	0.03	0.06
Panel B: Global Bond Markets										
	AUD	CAD	CHF	EUR	GBP	JPY	NOK	NZD	SEK	DOL
Direct Bidders	7.87 (5.64)	0.06 (3.93)	1.21 (3.29)	1.80 (4.52)	2.63 (4.86)	2.25 (2.05)	3.80 (5.84)	11.98** (4.75)	-1.34 (4.65)	3.36 (3.55)
Indirect Bidders	3.66 (3.55)	7.95** (3.52)	3.63 (2.29)	8.10*** (3.01)	11.07*** (3.80)	1.35 (1.48)	2.95 (3.18)	3.50 (3.41)	7.67** (3.12)	5.54** (2.30)
Primary Dealers	4.97 (4.26)	3.84 (2.95)	5.28** (2.52)	3.15 (3.10)	5.59 (3.42)	-0.72 (1.89)	0.38 (3.35)	2.86 (2.85)	3.69 (3.25)	3.23 (2.39)
N	886	886	886	886	886	886	886	886	886	886
R ²	0.03	0.02	0.02	0.02	0.03	0.03	0.02	0.02	0.02	0.02

Appendix: Bid-to-Cover Regressions - Auction Allocation

$$\Delta s_t = \alpha + \psi_j \sum All_t^k + \varepsilon_t$$

$$\Delta y_t = \alpha + \phi_j \sum All_t^k + \varepsilon_t$$

Panel A: Currency Markets										
	AUD	CAD	CHF	EUR	GBP	JPY	NOK	NZD	SEK	DOL
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Investment Funds	0.15*** (0.05)	0.03 (0.03)	0.10*** (0.03)	0.11*** (0.03)	0.10*** (0.03)	0.12*** (0.03)	0.18*** (0.05)	0.16*** (0.05)	0.15*** (0.04)	0.12*** (0.03)
Foreign Investors	0.19*** (0.06)	0.11** (0.05)	0.11** (0.05)	0.16*** (0.04)	0.11*** (0.04)	0.15*** (0.05)	0.19*** (0.05)	0.20*** (0.06)	0.15*** (0.05)	0.15*** (0.04)
Miscellaneous	-0.00 (0.04)	0.06** (0.03)	0.05 (0.03)	0.04 (0.03)	0.02 (0.03)	0.04 (0.04)	0.02 (0.04)	-0.01 (0.05)	0.03 (0.04)	0.03 (0.03)
N	944	944	944	944	944	944	944	944	944	944
R ²	0.04	0.03	0.02	0.04	0.02	0.03	0.04	0.04	0.03	0.05
Panel B: Global Bond Markets										
	AUD	CAD	CHF	EUR	GBP	JPY	NOK	NZD	SEK	DOL
Investment Funds	0.27 (0.31)	0.65** (0.27)	0.20 (0.19)	0.58** (0.25)	0.69** (0.31)	0.11 (0.13)	0.33 (0.31)	0.40 (0.33)	0.45* (0.26)	0.41** (0.20)
Foreign Investors	0.32 (0.37)	0.16 (0.36)	0.11 (0.22)	0.31 (0.29)	0.39 (0.39)	0.04 (0.16)	0.22 (0.28)	0.11 (0.33)	0.60** (0.28)	0.25 (0.23)
Miscellaneous	-0.00 (0.51)	0.33 (0.37)	0.03 (0.28)	0.13 (0.35)	0.20 (0.39)	-0.03 (0.25)	-0.15 (0.37)	-0.27 (0.47)	-0.17 (0.35)	0.01 (0.29)
N	916	916	916	916	916	916	916	916	916	916
R ²	0.02	0.02	0.01	0.02	0.02	0.04	0.01	0.03	0.02	0.02